

Centralized wage bargaining and skill-biased technical change

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Abstract

Last decades have seen substantial changes in some countries' collective bargaining institutions, with a general trend towards more decentralized wage negotiations, specially in the Scandinavian countries.

This paper supports the hypothesis that deunionization and decentralization in the wage setting process is a consequence of a skill-biased technical change.

The main contribution of the paper relies on the novel way in which unions are modeled and on the way in which they are embeded into a standard model of frictional unemployment

1 Introduction

The last decades have seen important changes in the pattern of unionization and wage bargaining in the OECD countries. Wage bargaining can take place at different levels. At one extreme, workers and employers negotiate over wages and working conditions at the firm level while at the other extreme, national unions and employers' associations bargain for the whole country. An intermediate case is the sectorial, branch or industry-level.

According to the 1997 OECD's Employment Outlook, "*recent years have seen quite substantial changes in some countries' collective bargaining institutions*". And although the pattern has not been uniform in all OECD countries, during the 80s the main level of interaction in industrial relations shifted from national to industrial level and from industries to individual firms.

In most continental Europe, unions are still strong, and there are no clear signs of decline in union coverage. But several indexes of coordination and decentralization in union's bargaining for Europe show a trend towards more decentralized wage negotiations, especially in the Scandinavian countries, whose unionization rates were indeed the highest.

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Recently, new hypothesis for deunionization and decentralization in union's wage setting based on skill biased technical change have been advanced by Acemoglu et.al.(2001) and Ortigueira (2004). Their arguments rest on the view that unions are coalitions of heterogeneous workers which extract rents form employers and only exist insofar as members have an incentive to stay in the coalition and continue bargaining in a centralized fashion. The conjecture of these authors is that skill-biased technical change can dramatically alter such incentives¹.

Acemoglu et.al.(2001) explain the shift from centralization towards decentralization in the wage setting through the impact that this skill-bias has on wage compression in the sense that "*skill-biased technical change increases the outside option of skilled workers, undermining the coalition among skilled and unskilled workers in support of unions*". Whereas Ortigueira (2004) abstracts from issues of wage solidarity and explains the "*collapse of centralization as the result of technological progress, which (...) increased the productivity gap across skills. This increase in the technological heterogeneity among workers removes the (...) existence of rational expectations supporting centralized bargaining*".

Our paper is a contribution to this recent literature. We follow the main ideas presented in Acemoglu et. al. (2001), and we embed them in a simple search matching framework of frictional unemployment.

The structure of the paper is the following: in section 2, we present and justify the main assumptions of our model. In section 3 we present the model and define the equilibria. In section 4 we present the steady state equations. In section 5 we calibrate the model and present our results, and we conclude in section 6.

2 Main assumptions

Our paper is based on Acemoglu, Aghion and Violante (2001). We share the main assumptions of their model and we embed them into the search matching framework. Those assumptions are that (1) Unions exist and they provide some benefits either to the society or to some group of workers; (2) wage compression across workers with different skills is a characteristic of unions and (3) there is skill-biased technical change.

- Efficient unions:

There are two main streams in the literature of trade unions. The traditional one, focus on the view of unions as rent-seeking institutions, i.e., as organizations that coordinate workers in order to extract rents from the employers. In this framework, unions control the labor supply and end up distorting relative prices and reducing employment (McDonald and Solow (1981), Johnson (1990), Farber (1986)). From this perspective, unions generate a bad economic performance

¹For a survey of the impact of technical change on labor market see Hornstein, Krusell and Violante

and cause efficiency losses. The second stream of the literature on trade unions starts from the work of Hirschman (1970) who first rises the question that if unions are a source of inefficiency and/or a market distortion how can their presence be explained in so many countries and how can we explain the empirical evidence suggesting that high levels of unionization lead to a lower rates of unemployment?. These caveats lead to another approach in which unions are seen as efficiency-enhancing entities, which arise as a response to a particular form of market imperfection or an inadequate insurance against labor risks.

Along this line we find Freeman and Medoff (1984) who gave empirical support to the fact that on net, unions are beneficial for society because although it is true that they exert some monopoly power, this negative aspect can be outweighed by the beneficial effects they have on efficiency such as income distribution, social organization, reduction of labor turnover, etc. Other authors justify the existence of unions as a response to an inadequate insurance against labor risks. In this line we find Malcomson (1983), Agell (2000), Hogan (2001). In a sense, the union is seen as a substitute for legal contractual enforcement and can be used to promote more efficient levels of employment when legal contractual enforcement is unavailable. Checchi and Lucifora (2002) view unions as economic agents that supply *private and collective services to their members and perform useful roles, not fulfilled by markets or government institutions*. These services are substitutes for state's provision or certain labor market institutions.

In our framework, unions are coalitions of workers which extract rents from employers and play an efficiency-enhancing role responding to a very specific form of market imperfection: the search externality.

- Search externalities

In models of search and matching, firms post vacancies and unemployed workers search for jobs, and the outcome of a match between a vacancy and a searcher is a productive job. This matching process does not take place in an organized way. On the contrary, firms and workers behave uncoordinatedly, dedicating time and effort to the search of a partner. The probability that a firm or an unemployed worker find a partner depends on the relative number of vacancies and searchers. For example, an increase in the number of vacancies relative to the number of searchers increases the probability that an unemployed worker finds a job but reduces, at the same time, the probability that a vacancy get filled. This example shows that there is an externality in the market. Due to the fact that this externality is generated by the search activity, it is normally called search externality². Therefore, our unions internalize the only source of inefficiency in the search-matching framework: the search externality.

- Wage compression

A fairly robust empirical relation is that more centralized economies have significantly less earnings inequality compared with more decentralized ones. In

²Definition extracted from Bagliano and Bertola (2004)

general, collective bargaining agreements limit the ability of the firm to remunerate individual workers differently and, therefore, this form of setting wages called union "rate standardization policy" reduce wage dispersion considerably.

Furthermore, very centralized systems like the Nordic ones have received the name of "solidaristic systems" because of the tendency towards wage compression and the redistribution among workers.

In our model, wage compression will be generated endogenously, and we will impose redistribution among workers only in the case in which the wage bargaining is centralized.

3 The model

In this section we present a simple model of frictional unemployment and define the equilibrium under different levels of centralization in wage bargaining.

Unions are coalitions of workers that negotiate wages with firms taking into account the congesting effect that an additional searcher generates over the set of searchers already existing.

3.1 Description of the model

- Workers

Workers are heterogeneous: skilled (s) and unskilled (u). The measure of type- j workers is denoted by x_j , for $j = s, u$ and the total measure of workers is normalized to one. Workers are risk neutral. We assume perfect risk sharing among workers of the same type, and hence we can think of two representative households of size x_s and x_u each. Thus a household j , for $j = s, u$ solves the following problem,

$$\text{Max} \sum_{t=0}^{\infty} \beta^t c_{j,t} \quad 0 < \beta < 1 \quad (1)$$

where consumption equals the total wage bill $w_{j,t}n_{j,t}$. Employment, $n_{j,t}$ is a predetermined variable whose law of motion is given by

$$n_{j,t+1} = n_{j,t} - \lambda_j n_{j,t} + m_{j,t} u_{j,t} \quad \text{for } j = s, u \quad (2)$$

where $u_{j,t}$ denotes the measure of type- j searchers, $\lambda_j > 0$ is the rate of job destruction and $m_{j,t}$ is the perceived probability that an unemployed worker be matched in period t :

$$m_{j,t} = \frac{M_{j,t}}{u_{j,t}} \quad \text{for } j = s, u \quad (3)$$

- Capitalists

The owners of capital and firms are called capitalists. We assume that they are risk neutral and their only decision is to split current income between consumption and investment. Their objective is to maximize the discounted lifetime consumption of the aggregate good. Capitalists' income is made up of capital income and firm's profits. Thus, capitalists's time-t consumption, is determined by the budget constraint,

$$c_t + i_t = r_t k_t + \pi_t \quad (4)$$

where i_t denotes gross investment; π_t denotes firms' profits.

Capital depreciates at rate δ_t , and the law of motion for capital is:

$$k_{t+1} = (1 - \delta)k_t + i_t \quad (5)$$

Hence, it is straightforward to show that the optimal investment policy for the capitalists calls for,

$$1 + r_t - \delta = \frac{1}{\beta} \quad (6)$$

- Firms

The production sector is made up of identical competitive firms. There is a representative firm which uses capital and the two types of labor to produce the aggregate good. The production technology is represented by $F(k_t, n_{st}, n_{ut})$, where F is strictly jointly concave, twice continuously differentiable and increasing. Further assumptions on the elasticity of substitution between the two types of labor will be imposed below.

Since the labor market is frictional, the law of motion of employment to firms is,

$$n_{j,t+1} = n_{j,t} - \lambda n_{j,t} + \mu_{j,t} v_{j,t} \quad \text{for } j = s, u \quad (7)$$

where $\mu_{j,t}$ is the perceived probability (matching rate) that a vacancy of type-j be matched with an unemployed worker of the same type.

The firm hires capital and open vacancies to maximize the present value of cash flows,

$$\sum_{t=0}^{\infty} \frac{1}{\prod_{\tau=0}^t R_{\tau}} \left[F(k_t, n_{st}, n_{ut}) - r_t k_t - \sum_{j=s,u} w_{j,t} n_{j,t} - \sum_{j=s,u} a_{j,t} v_{j,t} \right] \quad (8)$$

subject to eq (7). $R_{\tau} = 1 + r_{\tau} - \delta$ is the gross rate of return, and $a_{j,t} v_{j,t}$ denotes the cost of opening $v_{j,t}$ vacancies of type-j.

The firm's demand for capital obeys the standard optimality condition,

$$F_k = r_t \quad (9)$$

where F_k denotes the marginal productivity of capital. The condition that determines the optimal number of vacancies of type- j at period t is given by

$$\mu_{j,t} J_{j,t} = a_{j,t} \quad (10)$$

where $J_{j,t}$ is the income value of type- j employment to the firm. This latter value satisfies the following arbitrage condition

$$(r_{t+1} - \delta)J_{j,t} = J_{j,t+1} - J_{j,t} - \lambda_j J_{j,t+1} + (F_{n_j,t+1} - w_{j,t+1}) \quad (11)$$

where F_{n_j} denotes the marginal productivity of type- j labor. This arbitrage equation establishes that the capital cost of the job, $(r_{t+1} - \delta)J_{j,t}$, must equal the job's yields, $F_{n_j,t+1}(k_t, n_{st}, n_{ut}) - w_{j,t+1}$, plus capital gains, $J_{t+1} - J_t$, net of the risk of losing the job, λJ_{t+1} .

- Matching

The total number of matches for a type of worker j taking place per unit of time is given by the matching function:

$$M_{j,t} = m(u_{j,t}, v_{j,t}) \quad (12)$$

where $u_{j,t}$ represents the total number of type- j searchers and $v_{j,t}$ the total number of vacancies of type- j .

The matching function is increasing in both arguments, concave and homogeneous of degree one

- Wage determination

We follow the standard literature on frictional unemployment and assume that wages are the solution to Nash-bargaining. The Nash solution maximizes the weighted product of the worker's and the firm's income values of employment. Hence, if we use p to denote the worker's bargaining power, the wage rate is,

$$w_{j,t} = \arg \max \left\{ W_{j,t}^p J_{j,t}^{(1-p)} \right\}, \text{ for } j = s, u \quad (13)$$

The first order condition to this maximization problem is $W_{j,t} = p(W_{j,t} + J_{j,t})$, which states that the worker will get a share p of the total income generated by the match.

3.2 The equilibrium

We analyze three types of equilibria. The difference among them relies on the existence or not of unions as institutions bargaining wages for the workers; and the redistribution or not among types of workers.

Under the decentralized equilibrium, workers bargain over wages directly with the firms. Under the intermediate equilibrium, unions are coalitions of homogeneous workers that negotiate wages with firms taking into account the

congesting effect that an additional searcher generates over the set of searchers already existing. Finally, under the centralized equilibrium, there exists a union federation that encompass both types of workers, internalize the congestion generated by unemployed workers in their search activity and redistribute among heterogeneous workers.

3.2.1 The economy without unions

In the economy without unions, when a worker decides to engage in looking for a job, he takes into consideration the probability of finding a job, i.e., the arrival rate to a job is a given parameter. Nevertheless, he does not take into account the fact that his search is congesting the market and can prejudice other searchers.

The value of employment for the household j , $W_{j,t}$ solves the following arbitrage condition

$$(r_{t+1} - \delta)W_{j,t} + m_{j,t+1}W_{j,t+1} = w_{j,t+1} + W_{j,t+1} - W_{j,t} - \lambda_j W_{j,t+1} \quad (14)$$

i.e. the capital cost of a job, $(r_{t+1} - \delta)W_{j,t}$, plus the opportunity cost, $m_{j,t+1}W_{j,t+1}$, must equal the yield of holding the job, which is made up of the wage rate, $w_{j,t+1}$ plus capital gains, $W_{j,t+1} - W_{j,t}$ net of the risk of losing the job, $\lambda_j W_{j,t+1}$. It should be noticed that in the economy without unions, households do not internalize the effects that the level of search exert on the probability of being matched. That is, households take $m_{j,t}$ parametrically.

The income value of type- j employment for a firm is given by eq.(11). Therefore, the optimal wage rate at time t is given by:

$$w_{j,t+1} = pFn_{j,t+1} + pm_{j,t+1}J_{j,t+1} \quad \text{for } j = s, u \quad (15)$$

We can define the equilibrium for this economy, the decentralized bargaining equilibrium, as a set of infinite sequences for the rental price of equipment $\{r_t\}$, wage rates $\{w_{ut}, w_{st}\}$, employment levels $\{n_{ut}, n_{st}\}$, capital $\{k_t\}$, vacancies $\{v_{u,t}, v_{s,t}\}$, arrival rate $\{m_{u,t}, m_{s,t}\}$ and matching rates $\{\mu_{ut}, \mu_{st}\}$ such that,

(i) Taking the rental prices and matching rates as given, $\{k_t\}$ and $\{v_{u,t}, v_{s,t}\}$ maximize the firms' profits.

(ii) Taking the rental price of equipment as given, $\{k_t\}$ maximizes capitalists' lifetime utility.

(iii) Wages are the Nash solution to uncoordinated bargaining problems.

(iv) Taking wages and matching rates, $\{n_{jt}\}$ and $\{c_{jt}\}$ solve the workers' optimization problem.

(v) Matching rates and arrival rates are given by the matching function.

3.2.2 The economy with unions

In this economy the unions internalize the congestion that the look for a job of a particular agent has on the other searchers's behavior of the same type. The

union internalizes part of the search externality generated in the market and bargain over the wage.

Let us assume the existence of two unions, one for each collar line. Unions internalize the effects of changes in employment in the matching rate and negotiate wages. The income value of employment for the union of workers of type j is now:

$$(r_{t+1} - \delta)W_{j,t} + \eta \cdot m_{j,t+1} W_{j,t+1} = w_{j,t+1} + W_{j,t+1} - W_{j,t} - \lambda_j W_{j,t+1} \quad (16)$$

where $\varepsilon_{j,t+1}$ is the fraction of type- j searchers in the total pool of searchers

Again, substituting the value functions into the FOC of the wage maximization problem, yield to the optimal wage rate for the type- j worker:

$$w_{j,t+1} = pF n_{j,t+1} + p\eta m_{t+1} J_{j,t+1} \text{ for } j = s, u \quad (17)$$

We can define the equilibrium for this economy or intermediate bargaining equilibrium, as a set of infinite sequences for the rental price of equipment $\{r_t\}$, wage rates $\{w_{ut}, w_{st}\}$, employment levels $\{n_{ut}, n_{st}\}$, capital $\{k_t\}$, vacancies $\{v_{u,t}, v_{s,t}\}$, arrival rates $\{m_{ut}, m_{st}\}$ and matching rates $\{\mu_{ut}, \mu_{st}\}$ such that,

(i) Taking the rental prices and matching rates as given, $\{k_t\}$ and $\{v_{u,t}, v_{s,t}\}$ maximize the firms' profits.

(ii) Taking the rental price of equipment as given, $\{k_t\}$ maximizes capitalists' lifetime utility.

(iii) Wages are the Nash solution to uncoordinated bargaining problems.

(iv) Taking wages and matching rates, $\{n_{jt}\}$ and $\{c_{jt}\}$ solve the representative households' optimization problem.

(v) Matching rates and arrival rates are given by the matching function.

3.2.3 The economy with a union federation

Now we assume the existence of a union federation that encompasses all sectoral unions in the economy. The role of the federation is to negotiate wages for both types of workers taking into account that the congestion that the search activity generates. The federation gives different weights to the different workers through the following specification of the welfare function:

$$Max \sum_{t=0}^{\infty} \beta^t [c_{u,t}^\alpha c_{s,t}^{1-\alpha}] \quad (18)$$

and redistribute across types of workers.

The income value of employment for the household j , $W_{j,t}$ solves the following arbitrage condition:

$$(r_{t+1} - \delta)W_{j,t} + m_{j,t+1}\eta W_{j,t+1} = \theta_{t+1}w_{j,t+1} + W_{j,t+1} - W_{j,t} - \lambda_j W_{j,t+1} \quad (19)$$

where θ_{t+1} is the shadow price of consumption.

$$\theta_{t+1} = \alpha \left(\frac{c_{s,t+1}}{c_{u,t+1}} \right)^{1-\alpha} = (1-\alpha) \left(\frac{c_{u,t+1}}{c_{s,t+1}} \right)^\alpha \quad (20)$$

The optimal wage rate for a type- j worker is given by the following expression:

$$w_{j,t+1} [\theta_{t+1}(1+p) + p] = pF n_{j,t+1} + p m_{t+1} \eta J_{j,t+1} \text{ for } j = s, u \quad (21)$$

We can define the equilibrium for this economy or centralized bargaining equilibrium, as a set of infinite sequences for the rental price of equipment $\{r_t\}$, wage rates $\{w_{ut}, w_{st}\}$, employment levels $\{n_{ut}, n_{st}\}$, capital $\{k_t\}$, vacancies $\{v_{u,t}, v_{s,t}\}$, arrival rates $\{m_{ut}, m_{st}\}$ and matching rates $\{\mu_{ut}, \mu_{st}\}$ such that,

(i) Taking the rental prices and matching rates as given, $\{k_t\}$ and $\{v_{u,t}, v_{s,t}\}$ maximize the firms' profits

(ii) Taking the rental price of equipment as given, $\{k_t\}$ maximizes capitalists' lifetime utility

(iii) Wages are the Nash solution to uncoordinated bargaining problems

(iv) Taking wages, matching rates and weights, $\{n_{jt}\}$ and $\{c_{jt}\}$ solve the representative households' optimization problem

(v) Matching rates and arrival rates are given by the matching function

4 Steady state

In this section we will present the equations that characterize the steady state equilibrium in the three cases presented above: the economy with and without unions and with the union federation. The differences among rely on the "wage equations":

4.1 Beveridge curves

The evolution of employment is given by the difference between two flows, the job creation and the job destruction,

$$n_{j,t+1} - n_{j,t} = m_{j,t} u_{j,t} - \lambda_j n_{j,t} \quad \text{for } j = s, u \quad (22)$$

Substituting the employment in terms of unemployment and taking into account that in the steady state, the mean rate of employment is constant, we can determine unemployment in terms of the two transition rates, λ_j and m_j

$$u_j = \frac{\lambda_j x_j}{\lambda_j + m_j} \quad \text{for } j = s, u \quad (23)$$

This equation, known as the Beveridge curve, implies that for a given λ_j and m_j , there is a unique equilibrium employment rate.

4.2 Job creation condition

Combining the first order conditions of the firm for vacancies and employment and taking into account that in the steady state $J_{j,t+1} = J_{j,t}$, we can obtain the following expression:

$$a_j = \mu_j \frac{(F_{n_j} - w_j)}{(r + \lambda_j - \delta)} \quad (24)$$

substituting the matching rates in terms of unemployment and vacancies, i.e. we obtain the job creation condition for the firms:

$$v_j = \frac{(F_{n_j} - w_j)}{(r + \lambda_j - \delta)} \frac{m_j u_j}{a_j} \quad (25)$$

4.3 Optimal condition for capital

When the vacant is occupied, the firm rents capital and produces output. The rent of capital is such that it satisfies the following condition:

$$F_k = r \quad (26)$$

4.4 Optimal investment policy for the capitalists

From the maximization problem of the capitalists, we find that the optimal investment policy calls for,

$$1 + r_t - \delta = \frac{1}{\beta} \quad (27)$$

4.5 Wage equation

- In an economy without unions, the wage rate in the steady state is given by the following expression:

$$w_j = pF_{n_j} + pa_j \frac{v_j}{u_j} \quad \text{for } j = s, u \quad (28)$$

- In an economy with unions, is given by

$$w_j = pF_{n_j} + p\eta a_j \frac{v_j}{u_j} \quad \text{for } j = s, u \quad (29)$$

- In an economy with a union federation, is given by the following equation:

$$w_j = \frac{1}{\theta(1+p) + p} \left(pF_{n_j} + p\eta a_j \frac{v_j}{u_j} \right) \quad \text{for } j = s, u \quad (30)$$

5 Calibration and results

Before moving to the calibration we choose the functional forms for the matching function and the production technology. The total number of matches at time t , M_t is given by a Cobb-Douglas matching function in the total number of searchers $u_{j,t}$, and vacancies, $v_{j,t}$, where η is a parameter,

$$M_{j,t} = M_{j,o} (u_{j,t})^\eta (v_{j,t})^{(1-\eta)} \quad (31)$$

The reason for this choice is the empirical literature on frictional labor markets which finds that the Cobb-Douglas specification of the matching function fits the data well.

The production function is the one proposed by Heckman, Lochner and Taber (1998) for the US economy:

$$F(k, n_s, n_u) = \left[a_2 k^{\rho_2} + (1 - a_2)(a_1 n_s^{\rho_1} + (1 - a_1)n_u^{\rho_1})^{\rho_2/\rho_1} \right]^{1/\rho_2} \quad (32)$$

where $\frac{1}{1-\rho_2}$ denotes the elasticity of substitution between capital and aggregate labor, and $\frac{1}{1-\rho_1}$ denotes the elasticity of substitution between skilled and unskilled labor. With this specification, the skill-biased technical change is represented by changes in a_1 .

5.1 Calibration

In order to calculate the equilibrium we need to assign values to all the parameters in the model. We set in advance as many parameters as possible using a priori information and data for the Swedish economy for 1970 .

The number of unskilled workers is set in such a way that the fraction of labor force with university degree would be 5%. The rate of depreciation of capital is of 8%. Following Heckman et.al.(1998) the estimated elasticity of substitution between capital an labor is not statistically significantly different from 1, which implies a value for ρ_2 equals to zero.

The remaining parameters are selected in order to have the following values in equilibrium:

- (i) unemployment rates for the skilled and unskilled workers of 0.5% and 2.3%.
- (ii) a capital share on income of 30%.
- (iii) log wage differential of 0.5

The figures above correspond to the ones presented in Ortigueira (2004). We will use those values to calibrate our model under the union federation, which is the one that correspond to the situation presented by Nordic countries until the eighties. Once we will have all the parameters, we will use them to compute the other situations and extract conclusions from them.

Thus, the parameter values used in the model are presented in the following table:

Workers	Capitalists	Technology	Matching
$x_u = 0.95$	$\beta = 0.95$	$\rho_1 = 0.209$	$a_u = 0.072$
$x_s = 0.05$	$\delta = 0.08$	$\rho_2 = 0.002$	$a_s = 0.104$
$p = 0.6$	$r = 0.13$	$a_1 = 0.14$	$\lambda_u = 0.02$
$\alpha_j = 0.93$		$a_2 = 0.04$	$\lambda_s = 0.05$
			$\eta = 0.5$

The fact that the parameter of the matching function $\eta = 0.5$ differs from the bargaining power $p = 0.6$, imply there is no symmetry between unions and firms, and therefore is consistent with our assumption that unions extract rents from the firms. It implies as well that the Hosios condition for efficiency does not hold and yields room for the possibility of talking about efficient unions as entities which internalize the externality that searchers generate among themselves.

5.2 Results

As we have already said, the way in which we have proceeded consists in calibrating the parameters of the model for the centralized wage bargaining case, which is the one that matches the situation of the Swedish economy in 1970. Once we have obtained these parameters, we use them to obtain the performance of the main economic variables under different levels of wage bargaining.

Two results deserve special attention. The first one is that wage compression arises in the presence of unions. This result is interesting in the sense that we have not imposed it but results as an outcome of the way in which we have modeled unions. The second interesting result is that, in terms of welfare, both the very decentralized and the very centralized case work better than the intermediate case. We can interpret this result in line of the hump-shaped curve proposed by Calmfors and Drifill (1988), who find that intermediate levels of centralization yield the worst outcome in terms of macroeconomic performance. The idea behind their study, stated as well by Olson (1982) is that under intermediate levels of wage bargaining, organized interest are strong enough to cause major disruptions but not sufficiently encompassing to take into account the costs of their actions for the society.

But apart from the results above the main exercise of the paper have consisted on increasing the value of the parameter a_1 of the production function, which can be identify as a skill-biased technical change that increase the productivity of the skilled workers relative to the unskilled, at the same time that we increase the relative number of skilled workers with respect to the unskilled. With this change, keeping constant the remainder parameters obtained in the calibration above, we can see how the skilled workers have an incentive to leave the union federation and move towards more decentralized systems of wage bargaining.

The underlying explanation is that skilled workers cross subsidize unskilled workers through their unionization decisions. This situation is sustainable in

the case in which the productivity gap among these two types of workers is not very high. The presence of a skill-biased technical change that increase the productivity gap and also the relative number of skilled workers over the unskilled undermine the coalition.

Acemoglu, Aghion and Violante (2001) find that when unions play an efficiency-enhancing role, deunionization may happen inefficiently in the sense that skilled workers ignore the positive effect that they are generating on the unskilled through the redistribution and tend to deunionize too soon. Similar results can be extracted from our results because there is room for a reduction in the rate of redistribution from skilled to unskilled workers which could have generated increases in welfare for both types of workers.

It is worth noting that our result is also in line with the theories of endogenous formation of coalitions in which two groups of heterogeneous workers may form either a joint union or two separate unions depending on the relative size and productivity of the two groups. They form a single union when the two types are substitutes, since the workers' bargaining power comes from the loss that they can impose on the firm by refusing to work, each separate union will have less bargaining power if the two types are substitutes, hence, they will tend to form a single union. In this sense, we can see a skill-biased technical change as a way of "heterogeneize" workers and reduce the substitutability among them.

6 Conclusion

With this paper we contribute to the recent literature on deunionization and decentralization in the wage setting process. We have tried to explain the tendency towards decentralization in the wage setting process through a model in which unions act as coalitions of workers that bargain wages with the firms. Unions extract rents from the firms along the bargain process at the same time as they play an efficiency enhancing role taking into consideration the congesting effect that searchers generate over each other.

We embed these unions into a simple search-matching framework to show that, for the values obtained under the calibration, a skill-biased technical change increases the productivity gap across heterogeneous workers and generate the collapse of very centralized systems of wage bargaining characterized by high levels of redistribution across workers.

Two other interesting results arise from our model. The first one is that unions generate wage compression and the second is that extreme ways of wage bargaining perform better than intermediate ways.

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